## AMENDMENTS TO THE CLAIMS

### In The Claims

Applicant submits below a complete listing of the current claims, with insertions, if any, indicated by underlining and deletions, if any, indicated by strikeouts and/or double bracketing.

This listing of claims will replace all prior versions of claims in the application:

1. (Currently amended) A receiver, for use in an ~~OFDM~~ Orthogonal Frequency Division Multiplexing (OFDM) transmission system, ~~having~~ comprising an adaptive channel equalizer means, detector means, equalization parameter updating means, a sampling clock and a sampling clock control means, ~~wherein~~ the equalization parameter updating means ~~responds~~ responding to outputs of the detector means and the adaptive channel equalizer means to provide an equalizer parameter to the adaptive channel equalizer means, the equalization parameter updating means including an ambiguity prevention ~~means~~ mechanism to prevent said adaptive channel equalizer means from operating on time differences between the receiver and a transmitter which should be corrected by operation of said sampling clock control means,

~~wherein~~ the equalizer parameter ~~has~~ having an equalizer parameter argument function and ~~wherein~~ said adaptive channel equalizer means ~~is~~ being prevented from operating on said time differences by forcing a slope of a linear part of the equalizer parameter argument function to be always zero,

~~wherein~~ said sampling clock ~~has~~ having a sampling clock frequency, said adaptive channel equalizer means ~~provides~~ providing an equalizer output vector U, and said detector means ~~provides~~ providing a quantized vector Y, ~~and wherein~~ said sampling clock frequency ~~is~~ being controlled by a feed-back signal generated from an estimated slope of an argument function, $Y^{*}.U$ which is the element- by-element product of the equalizer output vector U and the conjugate of the quantized vector Y.

2. (Previously presented) A receiver, as claimed in claim 1, wherein said adaptive channel equalizer means provides an equalized data stream and wherein said sampling clock is controlled by data derived from the equalized data stream.

3.-5. (Cancelled)

6. (Currently amended) A receiver, as claimed in claim [[4-1]] 1, wherein the slope of said equalizer parameter argument function is derived by taking an average slope of the equalizer parameter argument function by unwrapping said equalizer parameter argument function and deriving said average slope from said unwrapped equalizer parameter argument function.

7. (Currently amended) A receiver, as claimed in claim 6, wherein the average slope $\alpha_k$ of the linear part of the equalizer parameter argument function is calculated from:

$$\alpha_k = \frac{1}{N}\sum_n \frac{\angle EQ_{n,k}}{n} \qquad (1a)$$

where $\angle EQ$ is ~~an~~ the unwrapped equalizer parameter argument function, n is a carrier index, k is a frame number and N is a size of a received frequency ~~domain frame~~ band.

8. (Currently amended) A receiver, as claimed in claim 6, wherein the average slope $\alpha_k$ of the linear part of the equalizer parameter argument function is calculated from:

$$\alpha_k = \frac{2}{n_2 - n_0}\left(\sum_{n=n_1=1}^{n_2} \angle EQn,k - \sum_{n=n_0}^{n_1} \angle EQ_{n,k}\right) \qquad (1b)$$

where $\angle EQ$ is ~~an~~ the unwrapped equalizer parameter argument function, n is a carrier index, k is a frame number, N is a size of a received frequency ~~domain frame~~ band, $n_1$ divides ~~a~~ the received frequency band into two equal parts, and $n_0$[[,]] and $n_2$ are lower and upper limits, respectively, of the received frequency band.

9. (Currently amended) A receiver, as claimed in claim 8, wherein an input to the adaptive channel equalizer means represents a received signal and wherein, where several separate frequency bands are present in the received signal, the equation (1b) is applied to each frequency band separately and the average of the results employed as the slope of the equalizer parameter argument function.

10. (Previously presented) A receiver, as claimed in claim 1, wherein said equalizer parameter argument function is rotated in small steps until said slope is zero.

11. (Currently amended) A receiver, as claimed in claim 10, wherein said rotation is performed by using a vector L of complex numbers with unit magnitude and a linear argument function with a slope equal to a small fraction of the average slope $\alpha_k$, and wherein L is calculated from:

$$L_{n,k} = \exp(-j.\beta.\frac{n}{N}.\alpha_k) \qquad (2)$$

where $\beta$ controls the speed of adaptation to the zero slope, n is a carrier index and N is a size of a received frequency band.

12. (Currently amended) A receiver, as claimed in claim 1, wherein the equalizer parameter EQ is adaptively updated using an algorithm defined by:

$$EQ_{n,k+1} = \left[ EQ_{n,k} + \mu_1 . \frac{X^{\bullet}_{n,k}}{\left|X_{n,k}\right|^2} .(Y_{n,k} - U_{n,k}) \right] . L_{n,k} \qquad (3a)$$

where n is a carrier index, k is a frame number, $\mu_1$ is a first coefficient, X is a frequency domain input data, $Y_{n,k}$ is a quantized vector, $U_{n,k}$ is an equalizer output vector and $L_{n,k}$ is a vector of

complex numbers with unit magnitude and a linear argument function with a slope equal to a small fraction of the average slope.

13. (Currently amended) A receiver, as claimed in claim 1, wherein the equalizer parameter EQ is adaptively updated using an algorithm defined by:

$$EQ_{n,k+1} = \left[ EQ_{n,k} + \mu_2 . \frac{X^{\bullet}{}_{n,k}}{\left| X_{n,k} \right|} . (Y_{n,k} - U_{n,k}) \right] . L_{n,k} \qquad (3b)$$

where n is a carrier index, k is a frame number, $\mu_2$ is a second coefficient, X is a frequency domain input data, $Y_{n,k}$ is a quantized vector, $U_{n,k}$ is an equalizer output vector and $L_{n,k}$ is a vector of complex numbers with unit magnitude and a linear argument function with a slope equal to a small fraction of the average slope.

14. (Currently amended) A receiver, as claimed in claim 1, wherein the equalizer parameter EQ is adaptively updated using an algorithm defined by:

$$EQ_{n,k+1} = \left[ EQ_{n,k} + \mu_3 . X^{\bullet}{}_{n,k} . (Y_{n,k}) \right] L_{n,k} \qquad (3c)$$

where n is a carrier index, k is a frame number, $\mu_3$ is a third coefficient, X is a frequency domain input data and $L_{n,k}$ is a vector of complex numbers with unit magnitude and a linear argument function with a slope equal to a small fraction of the average slope.

15. (Previously presented) A receiver, as claimed in claim 12, wherein the algorithm defined by equation (3a) is employed during a start up sequence for said receiver.

16. (Previously presented) A receiver, as claimed in claim 14, wherein the algorithm defined by equation (3c) is used for tracking slow changes in the equalizer parameter EQ subsequent to a start up sequence for said receiver.

17. (Currently amended) A receiver, as claimed in claim 1, wherein said OFDM transmission system employs ~~DMT~~ Discrete Multi Tone (DMT).

18. (Currently amended) A receiver, as claimed in claim 1, wherein said OFDM transmission system is an ~~ADSL~~ Asymmetric Digital Subscriber Line (ADSL) system.

19. (Currently amended) A receiver, as claimed in claim 1, wherein said OFDM transmission system is a ~~VDSL~~ Very high data rate Digital Subscriber Line (VDSL) system.

20. (Previously presented) A receiver, as claimed in claim 1, wherein said OFDM transmission system is a mobile telecommunications system.

21. (Currently amended) An OFDM multi-carrier transmission system having at least one transmitter and a plurality of receivers, wherein ~~said receivers are receivers~~ each of the plurality of receivers is the receiver as claimed in claim 1.

22. (Previously presented) A transceiver, for use in the OFDM transmission system, wherein said transceiver includes the receiver as claimed in claim 1.

23. (Currently amended) In an ~~OFDM~~ Orthogonal Frequency Division Multiplexing (OFDM) transmission system having a transmitter and a receiver, said receiver having an adaptive channel equalizer ~~means~~, a detector ~~means~~, a sampling clock and a sampling clock ~~control means~~ controller, and said transmitter having a sampling clock, a method of maintaining synchronization between said receiver sampling clock and said transmitter sampling clock, comprising the steps of:

preventing said adaptive channel equalizer ~~means~~ from operating on time differences between the receiver and the transmitter which should be corrected by operation of said sampling clock ~~control means~~ controller;

controlling said adaptive channel equalizer ~~means~~ with an equalizer parameter having an equalizer parameter argument function, and preventing said adaptive channel equalizer ~~means~~ from operating on said time differences by forcing a slope of a linear part of the equalizer parameter argument function to be always zero;

wherein said receiver sampling clock has a sampling clock frequency, said adaptive channel equalizer ~~means~~ provides an equalizer output vector U, and said detector ~~means~~ provides a quantized vector Y, further comprising controlling said sampling clock frequency with a feed-back signal generated from an estimated slope of an argument function, $Y^{*}.U$ which is the element-by-element product of the equalizer output vector U and the conjugate of the quantized vector Y.

24. (Currently amended) A method, as claimed in claim 23, wherein said adaptive channel equalizer ~~means~~ provides an equalized data stream, comprising the step of controlling said receiver sampling clock with data derived from the equalized data stream.

25.-27. (Cancelled)

28. (Currently amended) A method, as claimed in claim 23, ~~comprising~~ the step of preventing comprising the step of deriving the slope of said equalizer parameter argument function by taking an average slope of the equalizer parameter argument function by unwrapping said equalizer parameter argument function and deriving said average slope from said unwrapped equalizer parameter argument function.

29. (Currently amended) A method, as claimed in claim 28, ~~comprising~~ the step of deriving the slope comprising the step of calculating the average slope $\alpha_k$ of the linear part of the equalizer parameter argument function from:

$$\alpha_k = \frac{1}{N}\sum_n \frac{\angle EQ_{n,k}}{n} \qquad (1a)$$

where $\angle EQ$ is the unwrapped equalizer parameter argument function, n is a carrier index, k is a frame number and N is a size of a received frequency ~~domain frame~~ band.

30. (Currently amended) A method, as claimed in claim 28, ~~comprising~~ the step of deriving the slope comprising the step of calculating the average slope $\alpha_k$ of the linear part of the equalizer parameter argument function from:

$$\alpha_k = \frac{2}{n_2 - n_0}\left(\sum_{n=n_1=1}^{n_2} \angle EQn,k - \sum_{n=n_0}^{n_1} \angle EQ_{n,k}\right) \qquad (1b)$$

where $\angle$ EQ is the unwrapped equalizer parameter argument function, n is a carrier index, k is a frame number, N is a size of a received frequency ~~domain frame~~ band, $n_1$ divides the received frequency band into two equal parts, and $n_0$ and $n_2$ are lower and upper limits, respectively, of the received frequency band.

31. (Currently amended) A method, as claimed in claim 30, wherein an input to the adaptive channel equalizer ~~mean~~ represents a received signal, the step of calculating the average slope comprising, where several separate frequency bands are present in the received signal, the step of applying equation (1b) to each frequency band separately and employing the average of the results as the slope of the equalizer parameter argument function.

32. (Currently amended) A method, as claimed in claim 23, ~~comprising~~ the step of controlling comprising the step of rotating said equalizer parameter argument function in small steps until said slope is zero.

33. (Currently amended) A method, ~~,~~ as claimed in claim 32, the step of rotating comprising the step of performing said rotation by using a vector L of complex numbers with unit

magnitude and a linear argument function with a slope equal to a small fraction ~~a~~ of the average slope $\alpha_k$, and calculating L from:

$$L_{n,k} = \exp(-j.\beta.\frac{n}{N}.\alpha_k) \tag{2}$$

where $\beta$ controls the speed of adaptation to the zero slope.

34. (Currently amended) A method, as claimed in claim 23, ~~comprising adaptively~~ further comprising the step of updating the equalizer parameter EQ adaptively using an algorithm defined by:

$$EQ_{n,k+1} = \left[ EQ_{n,k} + \mu_1 . \frac{X^{\bullet}_{n,k}}{\left| X_{n,k} \right|^2} . (Y_{n,k} - U_{n,k}) \right] . L_{n,k} \tag{3a}$$

where n is a carrier index, k is a frame number, $\mu_1$ is a first coefficient, X is a frequency domain input data, $Y_{n,k}$ is a quantized vector, $U_{n,k}$ is an equalizer output vector and $L_{n,k}$ is a vector of complex numbers with unit magnitude and a linear argument function with a slope equal to a small fraction of the average slope.

35. (Currently amended) A method, as claimed in claim 23, ~~comprising adaptively~~ further comprising the step of updating the equalizer parameter EQ adaptively using an algorithm defined by:

$$EQ_{n,k+1} = \left[ EQ_{n,k} + \mu_2 . \frac{X^{\bullet}_{n,k}}{\left| X_{n,k} \right|} . (Y_{n,k} - U_{n,k}) \right] . L_{n,k} \tag{3b}$$

where n is a carrier index, k is a frame number, $\mu_2$ is a second coefficient, X is a frequency domain input data, $Y_{n,k}$ is a quantized vector, $U_{n,k}$ is an equalizer output vector and $L_{n,k}$ is a vector of complex numbers with unit magnitude and a linear argument function with a slope equal to a small fraction of the average slope.

36. (Currently amended) A method, as claimed in claim 23, ~~comprising adaptively~~ further comprising the step of updating the equalizer parameter EQ adaptively using an algorithm defined by:

$$EQ_{n,k+1} = \left[EQ_{n,k} + \mu_3 . X^{*}{}_{n,k} . (Y_{n,k})\right] L_{n,k} \qquad (3c)$$

where n is a carrier index, k is a frame number, $\mu_3$ is a third coefficient, X is a frequency domain input data and $L_{n,k}$ is a vector of complex numbers with unit magnitude and a linear argument function with a slope equal to a small fraction of the average slope.

37. (Currently amended) A method, as claimed in claim 34, the step of updating comprising ~~by~~ employing the algorithm defined by equation (3a) during a start up sequence for said receiver.

38. (Currently amended) A method, as claimed in claim 36, the step of updating comprising using the algorithm defined by equation (3c) for tracking slow changes in the equalizer parameter EQ subsequent to a start up sequence for said receiver.

39. (Currently amended) A method, as claimed in claim 23, wherein said OFDM transmission system employs ~~DMT~~ Discrete Multi Tone (DMT).

40. (Currently amended) A method, as claimed in claim 23, wherein said OFDM transmission system is an ~~ADSL~~ Asymmetric Digital Subscriber Line (ADSL) system.

41. (Currently amended) A method, as claimed in claim 23, wherein said OFDM transmission system is a ~~VDSL~~ Very high data rate Digital Subscriber Line (VDSL) system.

42. (Previously presented) A method, as claimed claim 23, wherein said OFDM transmission system is a mobile telecommunications system.

43. (Currently amended) A receiver for use in ~~OFDM~~ an Orthogonal Frequency division Multiplexing (OFDM) transmission system, comprising:

an adaptive channel equalizer for receiving frequency domain input data and producing an equalized signal;

a detector for quantizing the equalized signal and producing a quantized signal;

a sampling clock;

a sampling clock controller for controlling the sampling clock in response to the equalized signal and the quantized signal; and

an equalization controller for controlling the adaptive channel equalizer in response to the frequency domain input data, the equalized signal and the quantized signal, the equalization controller including an ambiguity prevention mechanism for preventing the adaptive channel equalizer from operating on time differences between the receiver and a transmitter which are corrected by operation of the sampling clock controller,

wherein the equalization controller provides an equalization parameter having an equalization parameter argument function and wherein the adaptive channel equalizer is prevented from operating on the time differences by forcing a linear part of the equalizer parameter argument function to be zero; and

wherein the slope of the equalizer parameter argument function is derived by taking an average slope of the equalizer parameter argument function by unwrapping the equalizer parameter argument function and deriving the average slope from the unwrapped equalizer parameter argument function.

44.-45. (Cancelled)

46. (Currently amended) In an ~~OFDM~~ Orthogonal Frequency division Multiplexing (OFDM) transmission system having a transmitter and a receiver, the receiver including an adaptive channel equalizer, a sampling clock and a sampling clock controller, and the transmitter including a

sampling clock, a method in the receiver of maintaining sychronization between the receiver sampling clock and the transmitter sampling clock, the method comprising;

preventing the adaptive channel equalizer from operating on time differences between the receiver and the transmitter which are corrected by operation of the sampling clock controller;

controlling said adaptive channel equalizer with an equalizer parameter having an equalizer parameter argument function and preventing the adaptive channel equalizer from operating on the time differences by forcing the slope of a linear part of the equalizer parameter argument function to be zero; and

deriving the slope of the equalizer parameter argument function by taking an average slope of the equalizer argument function by unwrapping the equalizer parameter argument function and deriving the average slope from the unwrapped equalizer parameter argument function.

47.-49. (Cancelled)